Fault Study in the U-line on July 8, 2009

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July 15, 2009

An fault study was done in the very early morning of July 8, 2009. The AGS cycle is about 4.05 seconds. The "AGS late" proton beam intensities were about $0.8\text{-}0.9\times10^{11}$ per pulse (unless otherwise specified below) and the extracted proton beam intensities were about $0.5\text{-}0.6\times10^{11}$ protons per pulse. We have varied the locations of the chipmunk NMO86 in 3 different locations are shown in Figure 1. We did not change the location of NMO81 during this fault study and it was in the location that it has been for a long time in the UGE2 labyrinth. We have looked at the dose rates at the above two chipmunks during normal extraction/operation and when we created a fault by hitting proton beams at the WD1 magnet.

The dose rates for NMO81 and NMO82 different locations are stated as belows. Here the dose rates (averaged over 5-minute intervals) come from the "Curreng Logs" in "ChipmunkViewer" (which is a Linux command in the acnlinxx machine or one may call it from the "StartUp" interface).

Chipmunk/Location	Dose rates (mrem/hour)
NMO86 (A)	0.2 - 0.3
NMO86 (B)	~ 0.9
NMO86 (C)	~61
NMO81	0.2 - 0.3

A few notes:

i. When the chipmunk NMO86 was in locations "A" and "B", we also observed the dose rates when we hit the beam on WD1 (fault condition) which were either unchanged or slightly smaller than during the dose rates during normal operation (ie. beam extracted to the end of U-line). When the chipmunk NMO86 was in the location "C", it tripped for every pulse (the trip level for the NMO86 was set at 50 mrem/hour) and with a power dip, we didn't get to hit the WD1 magnet.

ii.   One can also go to LogView/Site_Monitoring/AllChipmunks.logreq to look at the counts of the chipmunks (which has a reading every 30 seconds) and use the formula:

$$\text{dose rate (mrem/hour)} = \frac{count\ difference}{duration} \times 3600 \times cons - offset$$

From the ChipmunkViewer, click "Database" and then click "View" and choose "Current", you can see that cons = 0.0025 and offset = 0.03 for the NMO86.

When the chipmunk NMO86 was at the location "C", the two pulses (which have tripped the access control system) gave rise to about **510** mrem/hour and **270** mrem/hour (by looking up from the "LogView" plot and applying the above formula). These two values are closer to the instantaneous dose rates compared to those that one could read from the ChipmunkViewer which had readings averaged over 5 minutes.

iii.   When the chipmunk NMO86 was at the location "A", we also tried to increase the "AGS late" intensities to about 1.1-1.2×10^{11} which resulted in extracted intensities about 0.7-0.8×10^{11}. We have observed that the dose rates were about 0.3-0.4 mrem/hour.

The Health Physicists have been checking for dose rates at both east and west sides (one near UGE2 and the other near the trailer 324) of the U-line when the chipmunk NMO86 was at the location "A" and when we had normal extraction or hit WD1. Apparently, they have recorded no dose even when we increased the intensities as stated in (iii) above.

However, a few days later on July 13, 2009, sometime after 3 pm, for the last part of the experiment E973 (Sandia), when a tungsten block of several cm thick was put in the beam in front of the target wheel of circuit boards, the chipmunk NMO81 might occasionally trip if we put proton beam of "AGS late" intensities ~1.5×10^{11} for every AGS cycle (~4.05 seconds). To avoid that, MCR has reduced pulse delivery to every other cycle to avoid tripping the chipmunk NMO81.
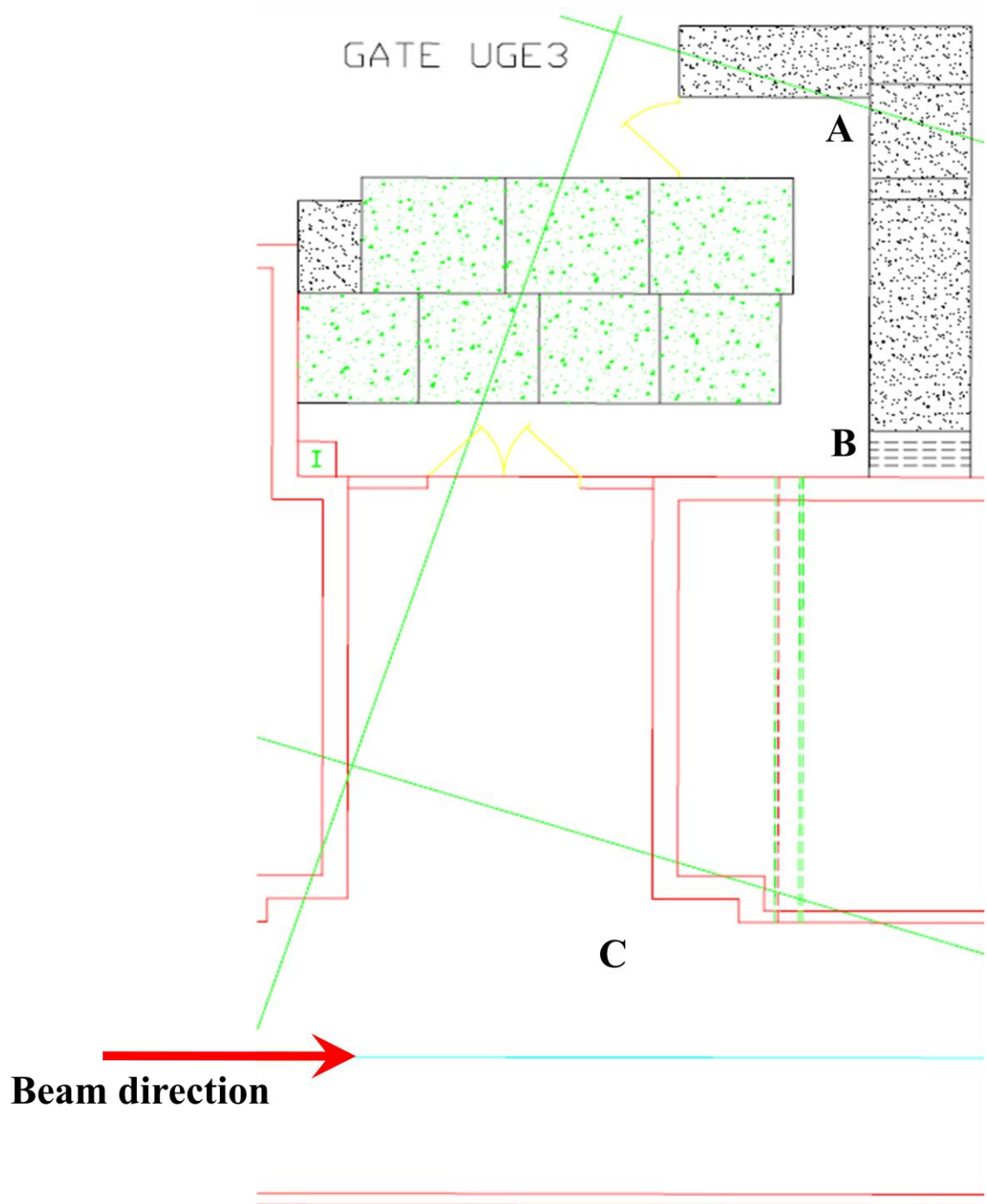
GATE UGE3

A

B

C

Beam direction

Figure 1: The chipmunks were put in 3 locations as labeled in the figure as "A", "B" and "C".